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„CAROL DAVILA”, BUCUREŞTI
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DOMENIUL MEDICINĂ GENERALĂ

ASSESSMENT OF THE HEALTH OF THE RURAL POPULATION

SUMMARY OF THE THESIS

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Content

List of published scientific papers

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2. Berbecar, V. T., Ismail, G., & Mircescu, G. (2021). Prevalence of hypertension and cardiovascular disease in the rural population: Results from the Romanian mobile health caravans. *J Comm Med and Pub Health Rep, 2(7).*

Introduction

Poor access of the rural population to health services is a major problem of the Romanian medical system. The needs of the population in rural areas are greater and more serious compared to the urban area where specialized medical services are currently concentrated. Data on the health status of the rural population are few, given that the rural population has a higher mortality rate than the urban population.

Rural Romania covers 87.1% of the country's surface and includes approximately 46% of its total population [1], [2]. A significant part of the population in these areas is experiencing severe poverty and poor living conditions [3], [4].

In Romania there are major inequities in terms of access to health services, which causes disparities in the health of different population groups, communities in different geographical areas and economically disadvantaged groups. These disparities are manifested by basic indicators of modest health (life expectancy at birth, infant mortality, overall mortality from preventable deaths, degree of morbidity, healthy life years) but also by the low level of knowledge regarding prevention along with poor accessibility to the Romanian health system.

Providing healthcare to rural and remote areas is challenging. Geographic access and transportation to medical services is an important factor for reduced healthcare usage in rural areas, especially because of spatial isolation from metropolitan areas or urban centers [5]. Inadequate availability or supply of rural healthcare services is the most important barrier to accessing services at times of need [6]. There is a shortage of general practitioners (GPs) especially in rural areas and there is a growing concern that healthcare systems will not be able to provide sufficient and close to home care to meet the future needs of an increasingly aging society [7].

The Romanian medical system is centered around the hospital, the majority of expenditures in the health system being in the hospital environment, although the distribution of the population by area of residence does not show significant differences: 54% urban vs. 46% rural [2].

Primary medicine has a basic role, and family doctors are the first filter in the patient's interaction with the health system. Consolidating and reforming primary care has been and is a widely debated topic, but primary care services remain underused and there is an overuse of hospital services.

Differences between rural and urban residents have been highlighted in many studies. Waist and hip circumference, body mass index and total cholesterol levels are higher in rural areas than in urban areas [8]. Having only primary education is more common in rural areas than in urban areas [9]. Cultural differences affect healthcare and can influence the threshold below which individuals choose not to seek medical intervention. Rural areas have lower levels of hospital use and have poorer health outcomes than urban areas [10]. Also, rural residents have fewer visits to the family doctor and consult fewer specialists for their care than their urban counterparts [11].

A large part of the Romanian population currently has a health education deficit, including a lack of awareness of the role of prevention and the habit of medical consultation in case of a problem, which demonstrates the reduced role that the health system has given to health education programs among the population. As a result, Romania has among the highest incidence in Europe of cardiovascular diseases, TB and other infectious or parasitic diseases [12].

Few scientific papers have tried to address the issue of health of the rural population in Romania. There are some studies that have accumulated information on the prevalence of hypertension, diabetes or other cardiovascular risk factors among the general population, including rural, but an overview that includes the main afflictions encountered in rural Romania as well as information about the health of the rural population has never been realized [13], [14].

Starting from the premises that the rural population has poor access to health services, the absence of data on the health status of the rural population and the need to improve medical services outside the university centers located in the city, this paper proposes to bring information about the current situation and health status, including the prevalence of the main diseases that affect the rural population.

The general part of this thesis includes a history of the Romanian medical system with an emphasis on rural health together with current information on how the Romanian health system is organized. The second part of the thesis, the special part, contains information about the epidemiology and infrastructure of the rural health system, along with 2 surveys in which data collected from the rural population during medical caravans were analyzed.

In the first study official information available at the National Institute of Statistics or reported to the European Commission (Eurostat database) was analyzed in order to describe the current state of health system infrastructure focusing on services available in rural areas, as well as to describe the adult rural population what should benefit from these services.

In the second study data was collected on the quality of living in rural Romania and on how it influences access to medical services. Several factors contribute to the low quality of living, such as the quality of housing, access to basic infrastructure or services, including healthcare, but also low income and education. In order to assess the extent to which the quality of living is related to the use of medical services, a questionnaire was applied to 703 respondents from 8 settlements located in southeastern Romania, in rural areas with low accessibility to medical services. The questionnaire included questions about housing quality, level of education, economic indicators, and indicators related to health care accesibility. After collecting the data, through the statistical technique of Principal Component Analysis, a composite Quality of Living Index (QoLI) was created to reflect the socio-economic status and living conditions in the studied areas. Subsequently, the links between quality of living, level of education, income and access to health services were assessed.

Four determinants were selected to calculate the QoLI: sewerage, room area per capita, housing accessibility, and type of cooking fuel. The QoLI calculated for each respondent ranged from 29.7 to 94.8 with an average value of 58.5. QoLI was directly related to the level of education and income and to several parameters regarding the access and use of medical services. The average value for each locality was used to establish a ranking, and the QoLI of the investigated settlements was consistent with the results reported by other studies that assessed the socio-economic development of territorial administrative units and can be used as a tool to establish the level of living conditions and prioritize the need of intervention.

In the third study we analyzed data regarding the health of the Romanian rural population that was collected during medical caravans organized in rural areas. The study analyzed data from caravans made between 2015-2017 in 20 small villages / towns, most located in southern and eastern Romania. The selection of the settlements was made in accordance with the objectives of the medical caravans, meant to provide basic medical assistance to people from rural areas with reduced access to medical services. A total of 2988 patients examined by volunteer physicians were included in the study. The parameters collected following the anamnesis, the clinical examination and the bloodwork were reported. Thus, data were collected on the prevalence of hypertension (HT), diabetes, dyslipidemia, obesity, and logistic regression determined cardiovascular risk factors (CV). The total number of registered CV diseases was analyzed, combining ischemic coronary heart disease, stroke, peripheral arterial disease and atrial fibrillation, and the risk of

developing cardiovascular disease was estimated using the Framingham score (which estimates the risk of developing a CV event in the next 10 years) [15] and SCORE (which estimates the risk of developing a fatal CV event in the next 10 years) [16]. The prevalence of chronic hepatitis with B (HBV) and C (HCV) virus and chronic kidney disease has been reported; the risk of developing chronic kidney disease has been calculated depending on the rate of glomerular filtration and proteinuria.

The overall prevalence of cardiovascular disease (CVD) was 14%: ischemic coronary heart disease (9%), stroke (2.9%), peripheral arterial disease (1.3%) and atrial fibrillation (3.2%). The prevalence of hypertension was unexpectedly high (72.8%), as was the proportion of newly diagnosed hypertension (33.3%). Of those who already had a diagnosis of hypertension, 65% underwent treatment, but only 17.2% had a blood pressure value in the therapeutic target. The prevalence of other CV risk factors was: obesity (31.3%), diabetes (12.6%), dyslipidemia (64.7%) and smoking (16.2%). Obesity, smoking and diabetes increased the probability of developing CV diseases by 1.7 times, HTA being the main risk factor that increased the risk by 2.7 times. The 10-year risk of developing a cardiovascular event (Framingham score) was high (over 20%) in one-third of subjects, while the risk of a fatal CV event occurring in the next 10 years (SCORE) was over 5% in almost a quarter (22%) of the studied population. The prevalence of chronic kidney disease was 5.9%, and hepatitis B and C of 3.7%, respectively 4.7%.

In this study, the first focusing on the health of the rural population in Romania, the prevalence of hypertension was unexpectedly high, as well as the risk of developing cardiovascular disease, indicating the need for strategies to improve medical services in rural areas.

The above-mentioned studies used data collected during medical caravans organized in rural areas. The concept of medical caravans is a relatively new concept that appeared in the last 10 years, which I developed together with other colleagues through the "Doctors' Caravan" Association where I am co-founder. The "Doctors' Caravan" Association is a non-governmental organization composed of doctors and medical students who travel voluntarily to rural areas of Romania and provide free medical services. This new way of providing medical services, through which the medical staff travels where they are most needed, appeared as a reaction to the shortage of medical services in rural areas. The project was a real success, realizing, in just a few years over 100 medical caravans from which tens of thousands of patients have benefited so far. The utility and efficiency of the caravans led me to write and propose in 2021, together with my colleagues, a draft law entitled the Mobile

Health Care Act, a legislative proposal that was ratified and adopted in Parliament in March 2022. The law aims to define the framework through which mobile medical services can be provided in areas with poor coverage of health services, for prevention and prophylaxis, screening of most frequent medical conditions, as well as periodic medical examinations. We hope that through this law, the model proposed by us will be adopted at a national level by as many health providers as possible, thus improving access to medical services in areas with poor coverage of health services.

1. Working hypothesis and general objectives

Poor access of the rural population to health services is a major problem of the Romanian medical system. The needs of the population in rural areas are greater and more serious compared to the urban area where specialized medical services are currently concentrated. Data on the health status of the rural population are few, given that the rural population has a higher mortality rate than the urban population.

Differences between rural and urban residents have been highlighted in many studies. Waist and hip circumference, body mass index and total cholesterol levels are higher in rural areas than in urban areas [8]. Having only primary education is more common in rural areas than in urban areas [9]. Cultural differences affect healthcare and can influence the threshold below which individuals choose not to seek medical intervention. Rural areas have lower levels of hospital use and have poorer health outcomes than urban areas [10]. Also, rural residents have fewer visits to the family doctor and consult fewer specialists for their care than their urban counterparts [11].

Few scientific papers have tried to address the issue of health of the rural population in Romania. There are some studies that have accumulated information on the prevalence of hypertension, diabetes or other cardiovascular risk factors among the general population, including rural, but an overview that includes the main afflictions encountered in rural Romania as well as information about the health of the rural population has never been realized [13], [14].

Starting from the premises that the rural population has poor access to health services, the absence of data on the health status of the rural population and the need to improve medical services outside the university centers located in the city, this paper proposes to bring information about the current situation and health status, including the prevalence of the main diseases that affect the rural population.

The general objectives are:

1. Analyzing the current data on the infrastructure of the health system and the demography of the adult population in Romania;

2. Determining the prevalence of the main diseases affecting the adult rural population of Romania;

3. Establishing the level of access and the frequency with which medical services are used by the rural population;

4. Correlating health status with living standards and conditions;

5. Comparing the data obtained with current information on the prevalence of diseases affecting the Romanian population;

6. Identifying the main causes responsible for poor access to medical services in rural areas and proposing solutions to reduce this deficit;

7. Presentation of the solutions and legislative projects that have been proposed to improve the access of the rural population to health services.

2. General research methodology

Information on the infrastructure of the health system and the demography of the adult population in Romania were collected and analyzed from official data available at the National Institute of Statistics, as well as from official data reported to the European Commission (*Eurostat database*).

To assess the health of the rural population, data were collected during health campaigns organized in rural areas in the form of medical caravans. The "Doctors' Caravan" Association is a non-governmental organization composed of doctors and medical students who travel and provide free medical care to people in areas with reduced access to medical services, mostly in rural areas, but also small towns with insufficient medical infrastructure. Data on the health of the examined population were collected and questionnaires were applied to achieve the objectives of the study.

The methodology of organizing caravans and collecting data initially involves obtaining informed consent from residents who wanted to be examined. The caravan takes place in 2 stages. Initially, blood tests are collected, which include: complete blood count, lipid profile (cholesterol, triglycerides), glycemia and glycosylated hemoglobin, ALT, creatinine, urinalysis, markers for the detection of chronic hepatitis B and C (HBsAg, anti-HCV Ac). After obtaining the results of the tests, a second visit is organized, where a team of doctors performs anamnesis and general clinical examination, measures blood pressure (BP) and performs EKG, the medical act ending with treatment recommendations based on clinical findings and laboratory tests.

Data was analyzed from caravans conducted during 2015-2017 in 20 small villages / towns, most of them located in the south and east of Romania. The selection of the settlements was made in accordance with the objectives of the association, meant to provide basic medical assistance to people from rural areas with reduced access to medical services.

To carry out the second study, we applied a social questionnaire during the medical caravans. The questionnaire included several sets of questions through which data was collected and used to compose a Quality of Living Index, as well as to explore the links between it and the level of education, income and access to health services.

In order to carry out the third study, we collected and analyzed the medical data from the population that benefited from the medical services offered during the caravans. Due to

several factors, including the large number of patients, multiple visits to the target locations, and the variability of the physicians who performed the examination, the magnitude of the data entered into the analysis was uneven: some patients performed blood tests but were not subsequently examined by physicians, while others benefited from only the clinical examination. Thus, the values recorded may differ in number and do not cover all patients included in the database equally.

Statistical analysis was performed using SPSS software version 20.

Descriptive analysis (mean, median, standard deviation for continuous data and frequency analysis for categorical data) was performed on all variables collected. Numerical variables that had a normal distribution were reported as mean and standard deviation, while variables with non-normal distribution were reported as median and first and third quartile (Q1, Q3). The Kolmogorov-Smirnov and Shapiro-Wilk tests were used to assess the distribution of continuous data, according to which appropriate tests were used for comparison between groups: independent t-test or Mann-Whitney U test for differences between 2 independent groups, ANOVA or the Kruskal-Wallis test for differences between 3 or more independent groups. The Chi-square test was used to analyze the differences between the categorical data. Binomial logistic regression was used to estimate risk factors. The Pearson bivariate correlation was used to describe the linear relationship between continuous variables, while the Spearman correlation was used for non-normally distributed continuous variables. An alpha level of $P < 0.05$ was used to test statistical significance.

3. Results from the 1st study

Population demography

Romania's population has experienced a steady decline over the past 20 years due to both the declining birth rate and the massive emigration that took place when Romania joined the European Union. According to the National Institute of Statistics, Romania's population in 2019 was 19,425,873 inhabitants, 46% (8,961,987) of whom resided in rural areas (Figure 3.1).

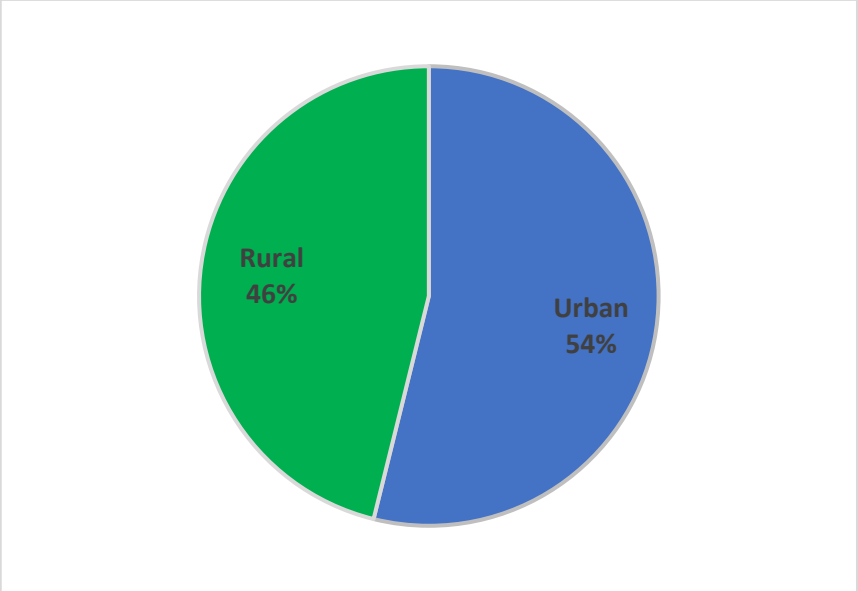

Figure 3.1. Romania's population by type of residence

The data shows a constant demographic decline of the Romanian population, both for rural as well as urban residents. The total population of Romania numbered 21,627,509 inhabitants in 2003, a number that has decreased steadily from year to year and continues to decline today. (Figure 3.2). Thus, we can speak of a decrease of the population by 10% in the last 15 years, a percentage that is significantly higher in rural than in urban areas (12% vs 8.5%).

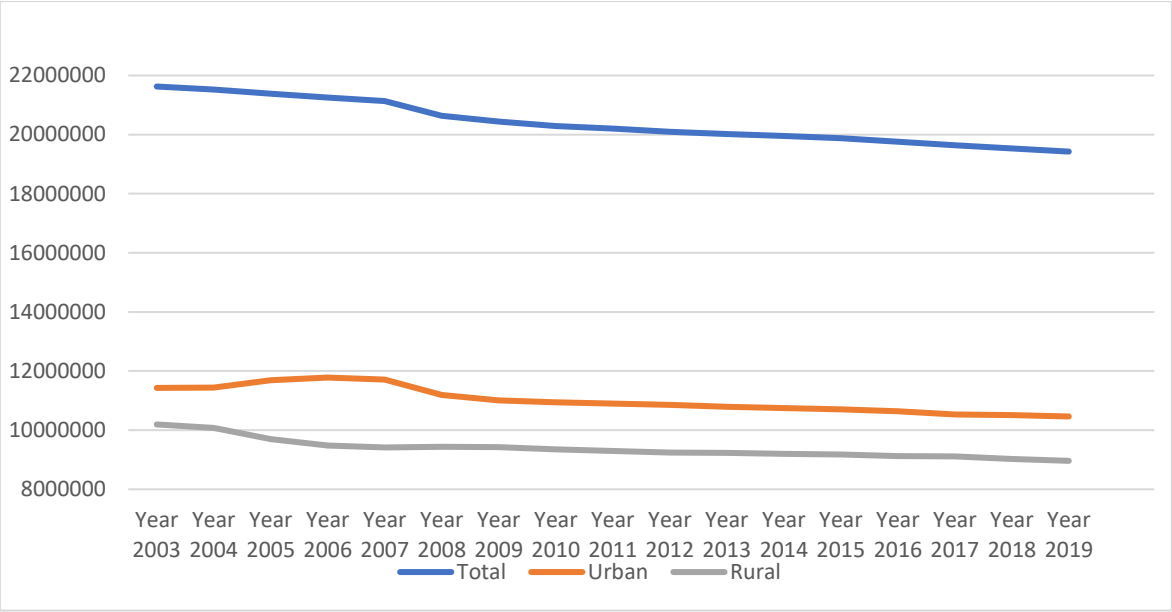

Figure 3.2. Evolution of the Romanian population (2003-2019)

Romania's population has a contrasting evolution and with a negative trend compared to the situation at European level, where there is an increase in the number of inhabitants, reaching 446,883,137 in 2019 (Figure 3.3). Thus, in the period 2003-2019, the European Union registered a positive population growth rate of 3.5%, compared to Romania, which experienced a 10% decrease in the total population.

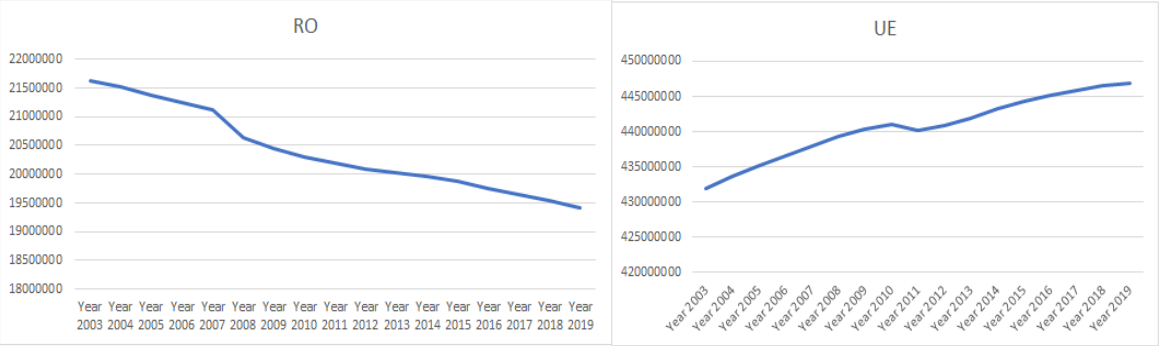

Figure 3.3. Evolution of the Romanian population compared to the EU population (2003-2019)

The average age of the population in 2019 was 42.2 years, with no significant differences between rural vs. urban population (42 vs. 42.3). However, there is an increase over time in the average age of the population, which increased by 1.4 years (compared to the average age of 40.8 years reported in 2012).

To assess the population dynamics and its age we can use the demographic aging index (Figure 3.4) which shows the number of elderly people (over 65 years) which amounts to 100 young people (under 15 years).

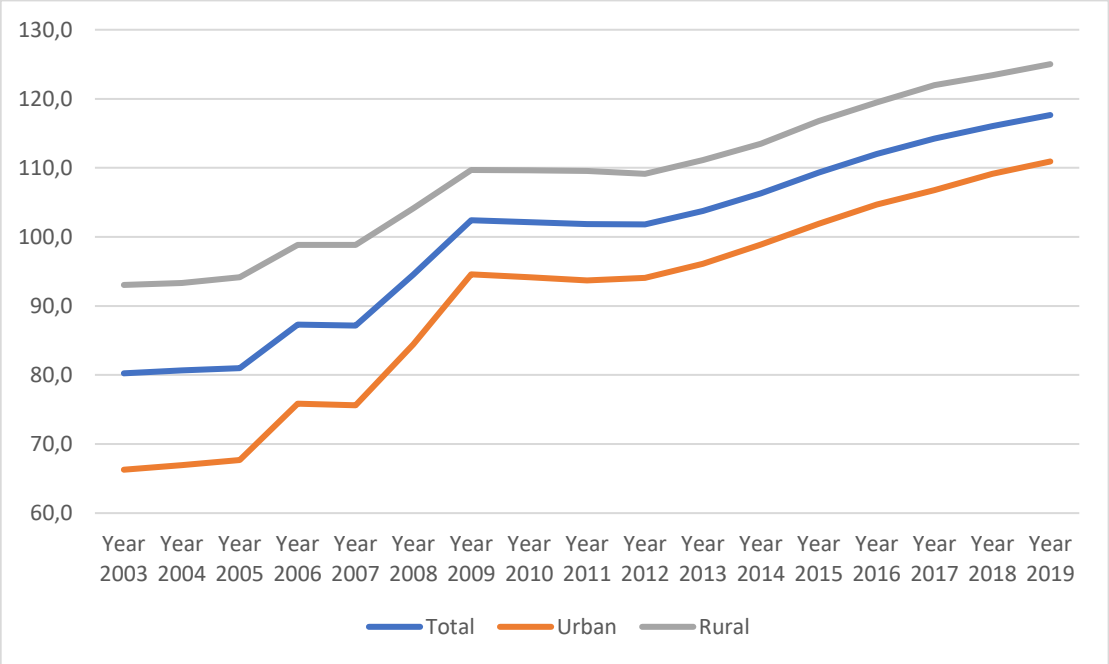

Figure 3.4. The demographic aging index (2003-2019)

There is a marked increase in the demographic aging index, which reaches 117 elderly people per 100 young people in 2019, given that only 15 years ago its value was 80. The phenomenon of demographic aging is even more obvious when we observe the evolution of the population over 65 years old. The share of the population aged> 65 in relation to the total population is 18.5%, and it is much higher in rural areas where we find a more aged population compared to urban areas (20.3% vs 16.9%) (Figure 3.5).

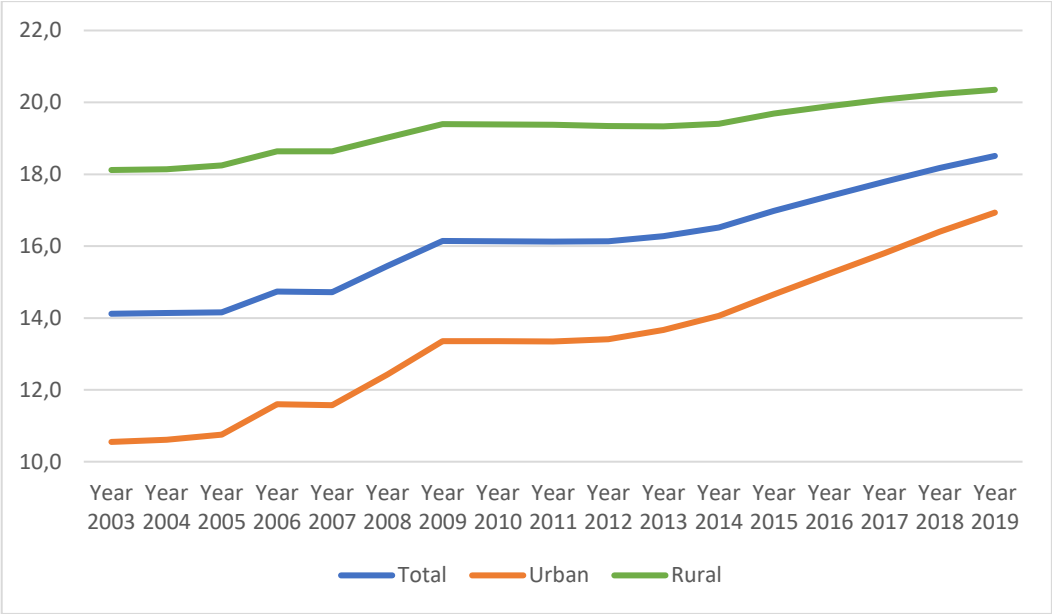

Figure 3.5. Share of the population aged> 65 (2003-2019).

One of the causes that increases the demographic aging phenomenon is the birth rate cap. The total number of births on the Romanian territory has remained relatively constant in the last 15 years, oscillating between 200,000 and 220,000 births per year. However, there is a decline in the total number of births in rural areas compared to urban ones. (Figure 3.6).

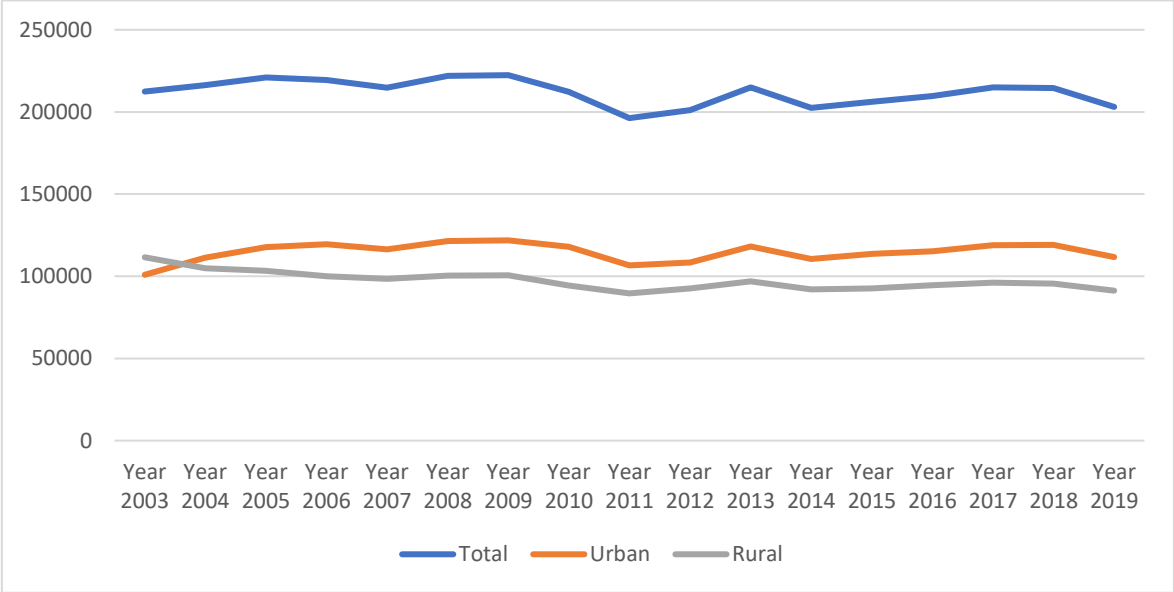

Figure 3.6. Number of births (2003-2019)

This becomes most obvious when we observe the evolution of the birth rate (the birth rate represents the number of live births in a year relative to the total number of the population and is expressed in the number of live births per 1000 inhabitants).

Regarding mortality, there is a discrepancy between the number of deaths relative to the population according to the area of residence, as it is much higher in rural areas (in 2019 - 134989 vs 125364) despite the lower number of inhabitants compared to urban areas. (Figure 3.7).

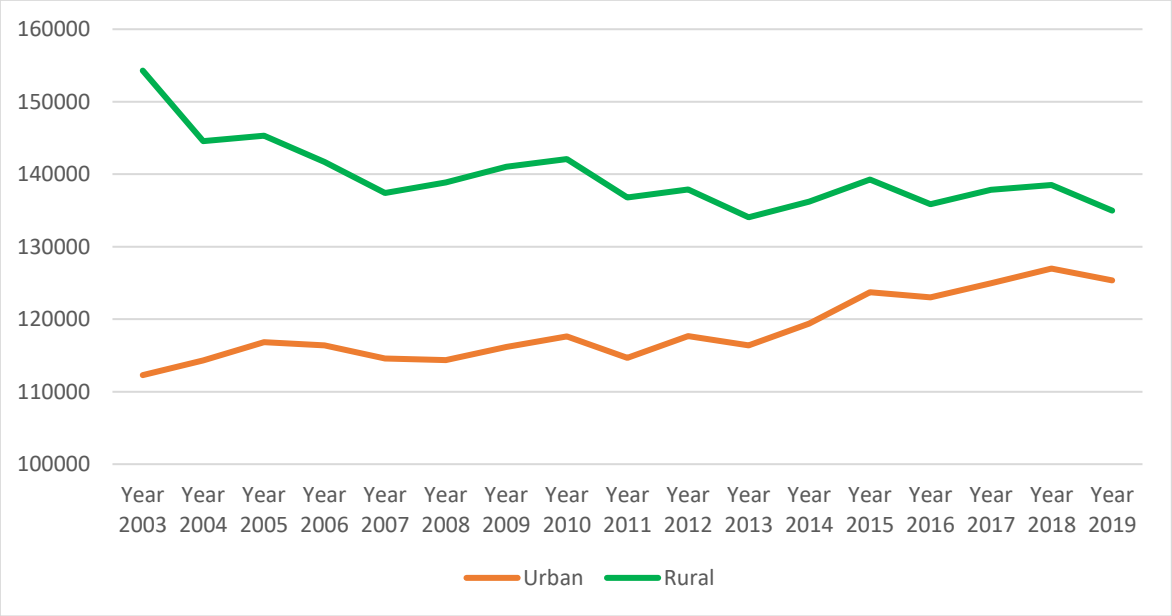

Figure 3.7. Number of deaths (2003-2019)

The higher mortality rate in rural areas than in urban areas has multiple causes, aspects that will be discussed during this thesis.

Rural health system infrastructure

There is a huge discrepancy between urban and rural inhabitants regarding the access to the healthcare in Romania. In 2019, according to the National Institute of Statistics, the activity in the health system, both public and private, took place in over 63 thousand health units, 81.5% of which are found in urban areas. The main data on the infrastructure of the Romanian health system can be found in Table 3.1.

Table 3.1. Number and type of health units

	Total	Urban	%	Rural	%
Health units	**63088**	**51405**	**81.5**	**11683**	**18.5**
Hospitals	523	476	91	47	9
Inpatient beds	134008	124036	92.6	9972	7.4
General practitioner offices	10866	6495	59.8	4371	40.2
Independent medical offices	12034	11540	95.9	494	4.1
Dental offices	16046	13790	85.9	2256	14.1
Pharmacies	9904	6091	61.5	3813	38.5
Phisicians	63303	57628	91	5675	9
General practitioners	12187	7804	64	4383	36
Dentists	17003	14892	87.6	2111	12.4
Pharmacists	18093	14794	81.8	3299	18.2
Other qualified medical staff	150251	133936	89.1	16315	10.9

By main categories of units, the health network had in 2019: 523 hospitals (of which 91% in urban and 9% in rural areas), over 12,034 independent medical offices (of which 95.9% in urban and 4.1% in rural areas), 16,046 independent dental offices (of which 85.9% in urban and 14.1% in rural areas), 10,866 family medicine offices (of which 59.8% in urban and 40.2% in rural areas), 9,904 pharmacies, drugstores and pharmaceutical points (of which 61.5% in urban and 38.5% in rural areas) (Figure 3.8).

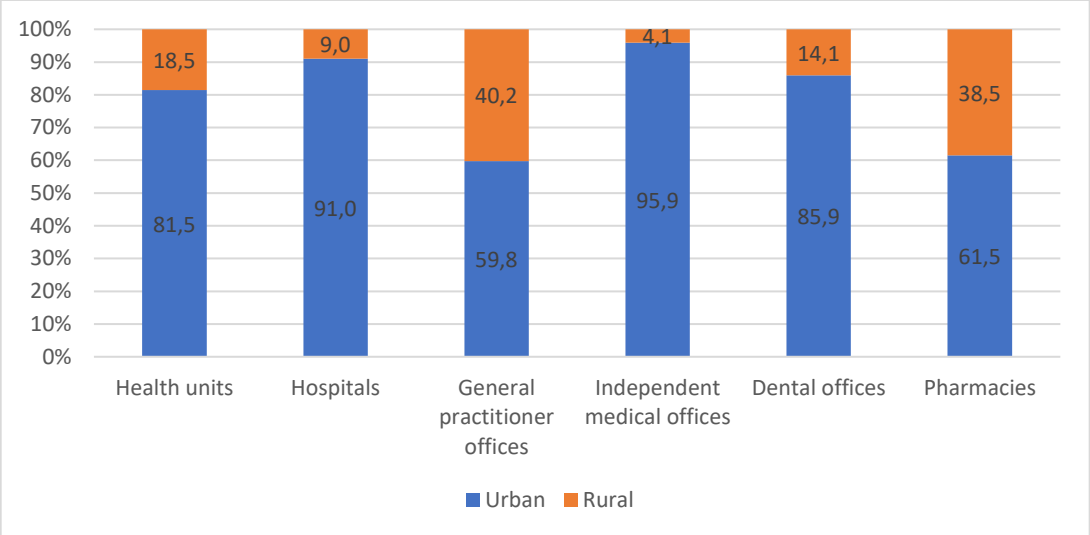

Figure 3.8. Distribution of health units by type of residence (2019)

In 2019, 4.25 million patients benefited from continuous hospitalization services, which means 22% of Romania's resident population. The average duration of hospitalization was 7.1 days / patient hospitalized.

In Romanian villages, a family medicine practice had 1.3 times more inhabitants allocated than an urban practice, and a rural specialized medical practice had 20 times more potential inhabitants that could access its services compared to urban areas.

Of the total number of doctors, almost two thirds worked in urban areas. In rural areas there are more than 8 times more inhabitants per doctor (1.3 times more inhabitants per general practitioner), 6 times more inhabitants per dentist and almost 4 times more many inhabitants per pharmacist compared to the urban environment (Figure 3.9).

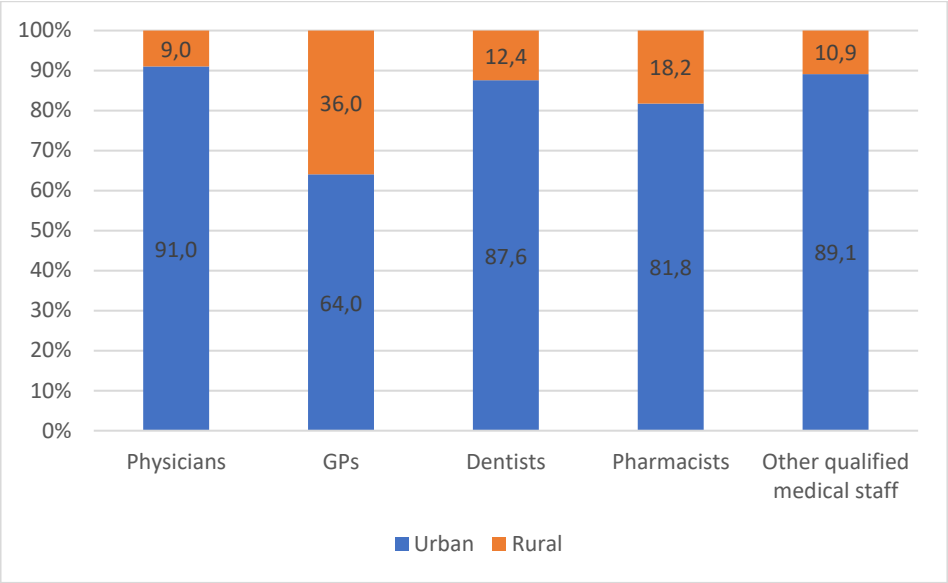

Figure 3.9. Distribution of the medical staff by type of residence (2019)

Compared to the other countries in the European Union, Romania is at the bottom of the ranking regarding specialized medical personnel. In 2018, we had 311 doctors per 100,000 inhabitants, compared to Germany or Lithuania, which had over 470 doctors per 100,000 inhabitants. Romania is thus on the bottom of the European ranking, being surpassed only by Poland with 258 doctors per 100,000 inhabitants (Figure 3.10).

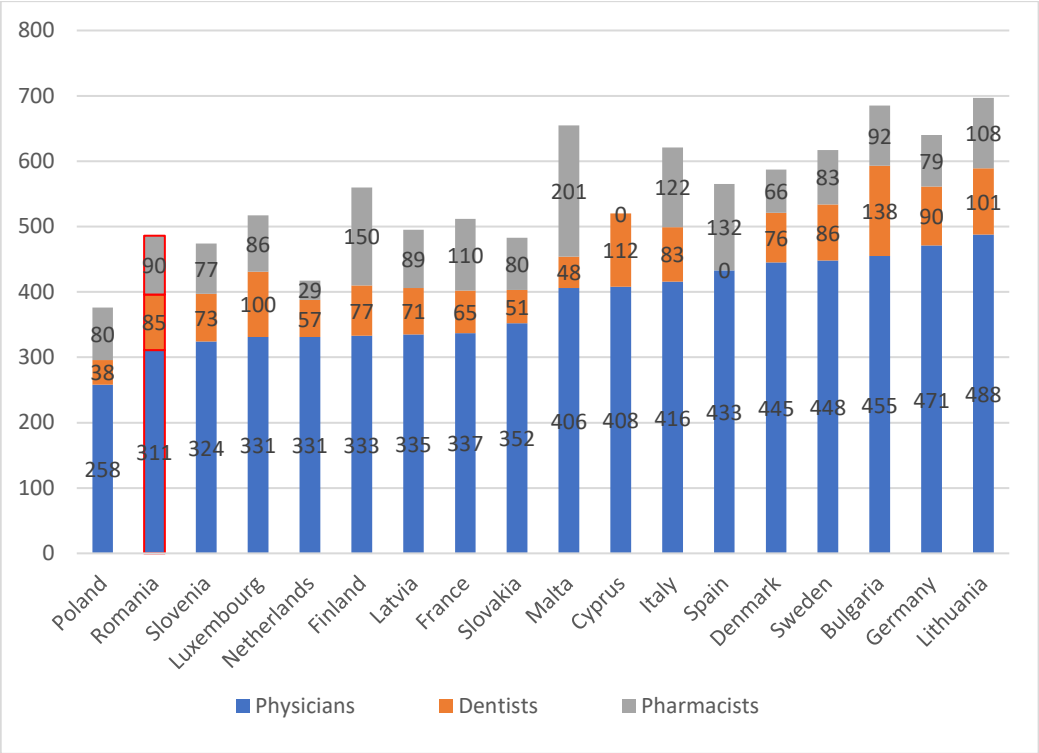

Figure 3.10. Number of medical staff per 100.000 inhabitants, EU 2018

However, it is interesting to analyze certain performance indicators of the health system. Romania is in the top of the countries in the European Union both in the average number of hospitalization days and in the number of hospital beds per 100,000 inhabitants. (Figure 3.11).[17]

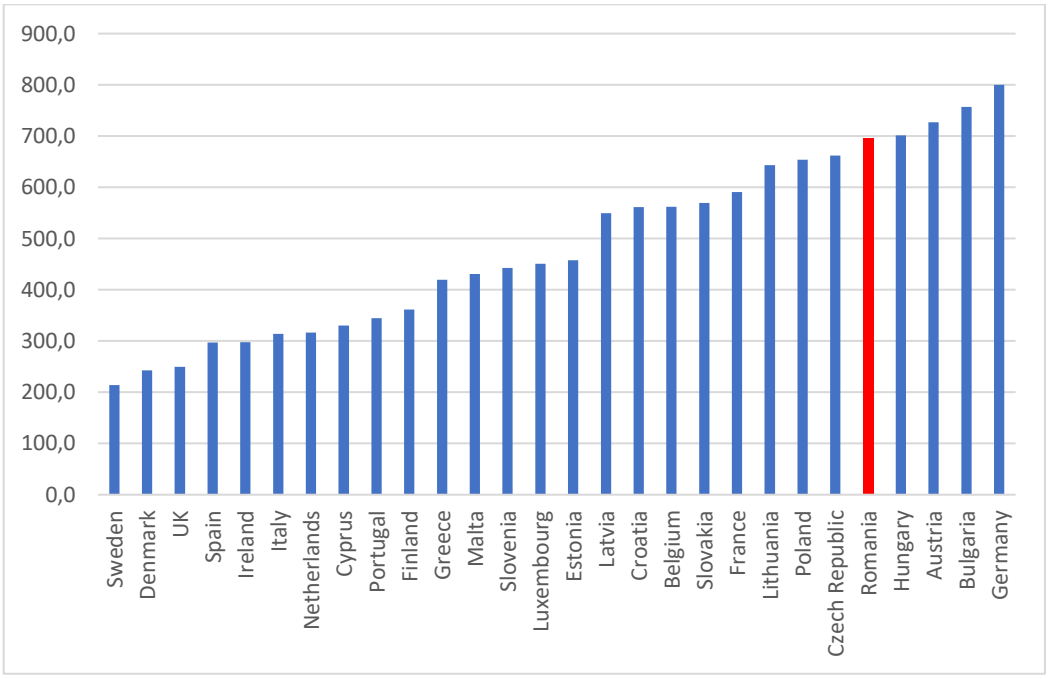

Figure 3.11. Number of hospital beds per 100.000 inhabitants, EU 2018

Epidemiological data

The main cause of death at the national level remains, of course, the cardiovascular pathology, but there are few studies to analyze how the rural population is affected and whether there are differences between the rural and urban population. (Figure 3.12).

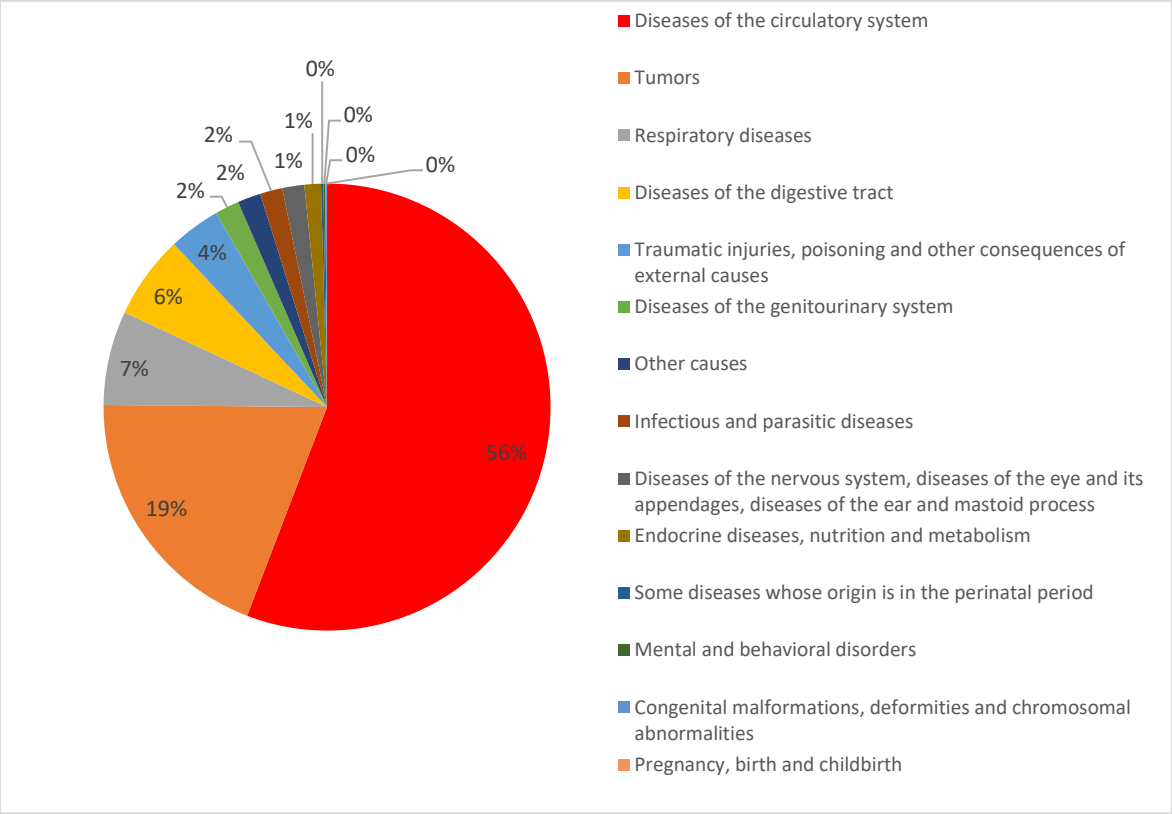

Figure 3.12. Main causes of death by category, 2019 - according to the International Classification of Diseases, 10th revision, 1994

Data from the European Register of Cardiovascular Diseases have shown that Romania has one of the highest cardiovascular mortality and is the leader in stroke mortality in Europe. [13], [18] Several studies that have analyzed the cardiovascular risk factors (CV) in the general population of Romania reported a prevalence of 45.1% for hypertension (HT), 31.9% for obesity, 11.6% for diabetes, and 67.1% for dyslipidemia [13], [19] - [21].

The latest study on HT in Romania, SEPHAR III, showed a HT prevalence of 45.1% in the general population. The study collected data from 1970 participants, the population being stratified by age groups and area of residence, which later established the prevalence in rural areas as 46.2%, compared to 44.4% in urban areas. [13]

4. Results from the 2nd study

The average age of the respondents was 53 years, and over two thirds (67%) were female. Three quarters declared to be married (75%) and 9% were widowed.

Almost 98% declared to live on private property – only 3% stated that they lived in social houses, the majority living in single-family houses (86%). 25% of the respondents claimed to live in adobe houses. The average surface of the housing units was 58.5±27.0 square meters with a mean number of dwellers/housing unit of 3.5±1.5 (Table 4.1).

Two thirds had attended only primary (17%) and middle school (47%), 30% had finished high school. A staggering 94% of the respondents did not have higher level education.

Regarding the medical questionnaire, about 10% of the respondents (n=618) had never been examined by a physician. The median time between visits to the doctor was 6 months (Q_1 1, Q_3 17; max 360). Also, 17% had never done a blood test and the median time from their last blood test was 12 months (Q_1 3, Q_3 36, max 360).

Table 4.1 The observed indicators of the Quality of Living

Indicators	N	Percent
Type of housing unit		
-house	588	87.0
-block of flats	88	13.0
Property type		
-private	580	85.5
-social housing	17	2.5
-group property	81	11.9
*Accessibility of the housing unit by road		
- Access by dirt road	108	16.2
- Access by paved road	275	41.3
- Access by asphalt road	283	42.5
Building materials of the residence		
-adobe	168	24.9
-concrete, brick, stone	508	75.1
*Bathroom		
- Does not have	72	10.6
- Outside of the residence	219	32.3
- Inside the residence – just toilet	74	10.9
- Inside the residence – with shower or hot tub	313	46.2
*Kitchen		
- No cooking facilities	3	0.4
- Kitchen outside of the residence	157	23.2
- Kitchen inside the residence	518	76.4
*Water supply		
- Doesn’t have	29	4.4
- From own system (well)	305	45.9
- From public network	330	49.7
*Hot water supply		

- Doesn’t have	145	21.5
- From own system (central heating, boiler)	428	63.6
- From public network	100	14.9
*Sewage		
- Doesn’t have	158	23.3
- Own system (septic tank)	347	51.3
- From public network	172	25.4
Electricity		
- Not available	669	98.7
- Available	8	1.2
*Type of fuel used for cooking		
- Electric energy	2	0.3
- Solid fuel (wood, coal)	66	9.7
- Liquefied gases (gas tank)	600	88.5
- From the public gas system	10	1.5
*Heating		
- Other	1	0.1
- Electric Energy	15	2.2
- Stove	598	88.2
- Gas cooker	6	0.9
- Personal central heating	45	6.6
- Public heating system	13	1.9
* variables retained in Quality of Living Index		

The QoLI computed for each respondent varied between 29.7 and 94.8 (as compared to a maximum value of 100). The mean value was 58.5, with 26% of the respondents having a staggering score bellow 50.

An average QoLI was calculated for the studied LAUs. The mean QoLI of the investigated LAUs was 60, Brăești village having the lowest value (47.5) (**Error! Reference source not found.**).

Table 4.2. The observed Quality of Life Index in investigated LAUs

LAUs	**Mean Quality of Living Index**
Brăești (Buzău county)	47.55
Slănic Moldova (Bacău county)	52.69
Slobozia (Argeș county)w	56.23
Scornicești (Olt county)	58.90
Maliuc (Tulcea county)	61.99
Sfântu Gheorghe (Tulcea county)	64.48
Priboieni (Argeș county)	66.43
Mihail Kogălniceanu (Constanța county)	75.37

The Quality of Living significantly varied according to the level of education. The mean QoLI increased by 6 points in those with middle school level, high school and college, as compared to those with primary school level ($F_{3,487}=32.67$; $p<0.001$). However, the increase was not significant in case of high school versus College/University, probably because of the low number of higher education graduates (Figure 4.1).

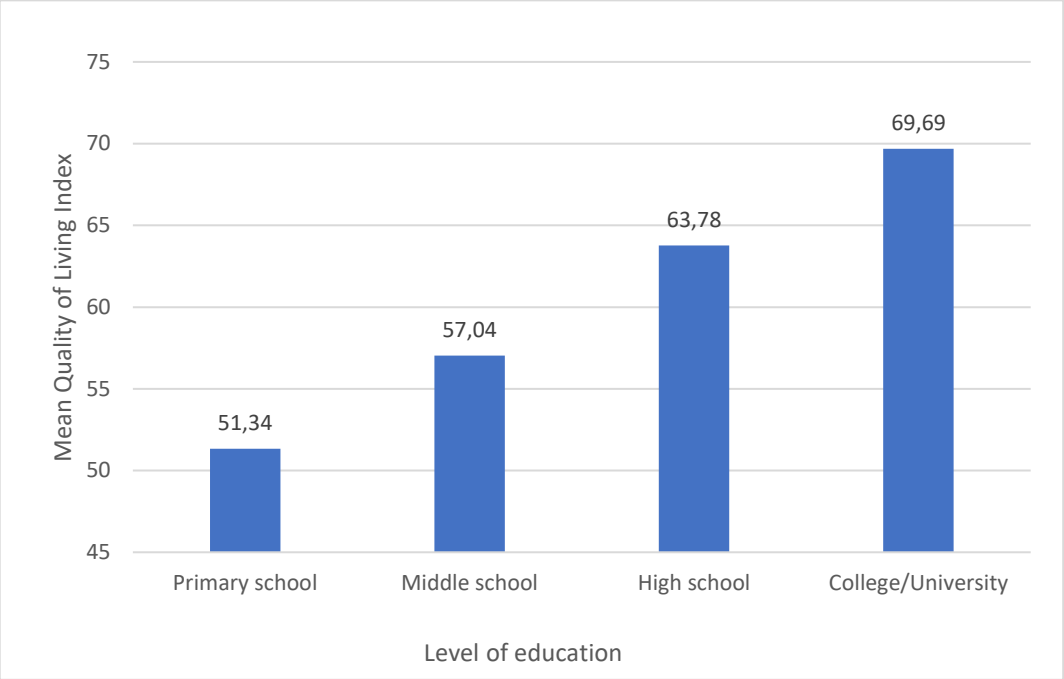

Figure 4.1. Mean QoLI according to the level of education

The same statement can be made when examining the relationship between QoLI and the income: the QoL increased in line with the income ($F_{3,456}=21.38$, $p<0.001$) ($F_{3,456}=21.38$, $p<0.001$) (Figure 4.2).

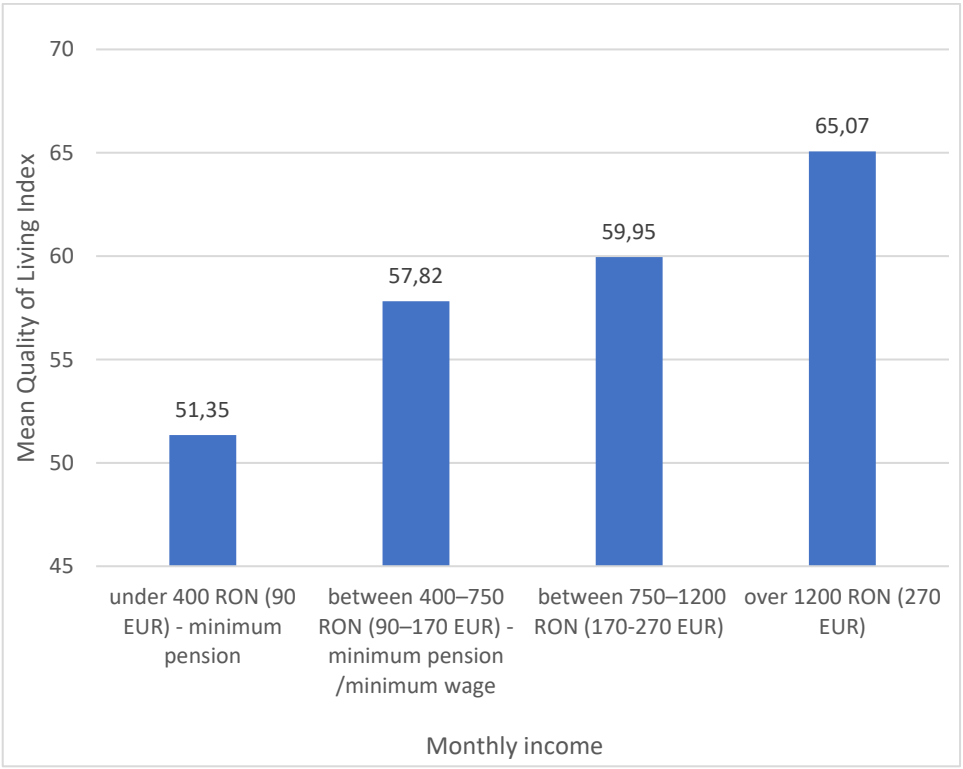

Figure 4.2. Mean QoLI for various levels of income

There is a strong correlation between the level of education and income (X2 (9) = 135,038, p <0,001) (Figure 4.3).

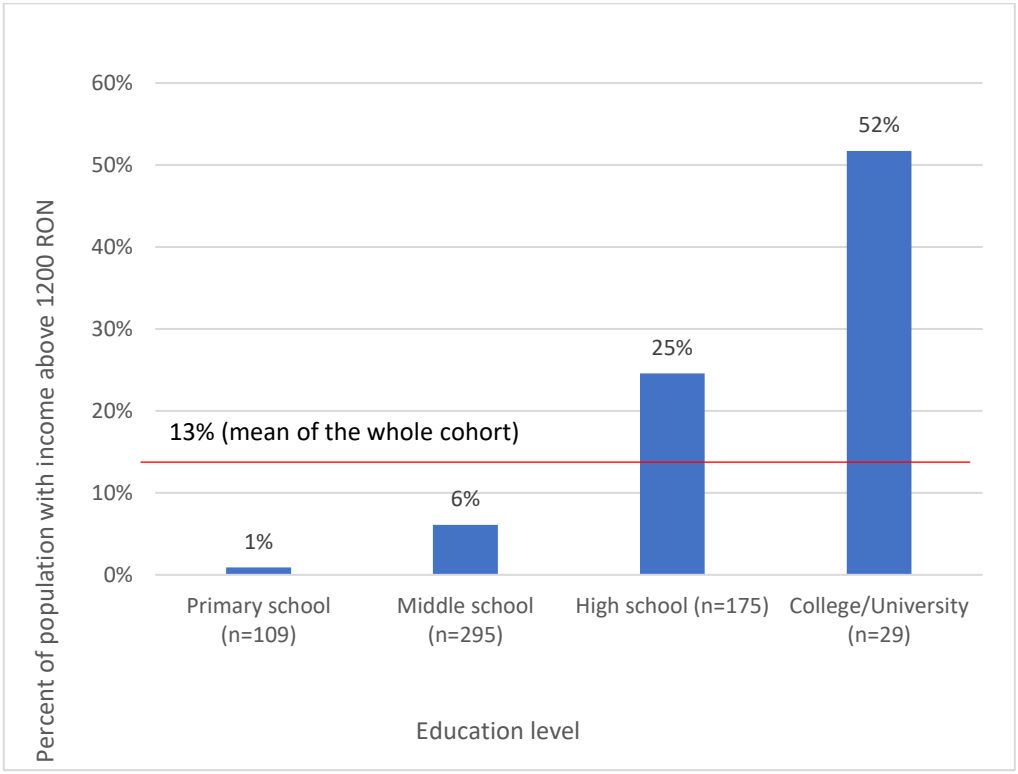

Figure 4.3. Percent of inhabitants with income above 1200 RON according to the level of education

When examining the relationship between the Quality of Living and healthcare indicators, the mean QoLI was higher in those who had visited the doctor in the past year than in those who hadn't been to the doctor for more than a year. Surprisingly, those who never visited the doctor had higher QoLI than those who went the doctor at least once ($F_{2,435}=9.15$, $p<0.001$) (Figure 4.4). There was a negative correlation between the time passed since the respondents' last visit to the doctor and their QoLI ($r_s=-0.13$, $p<0.01$).

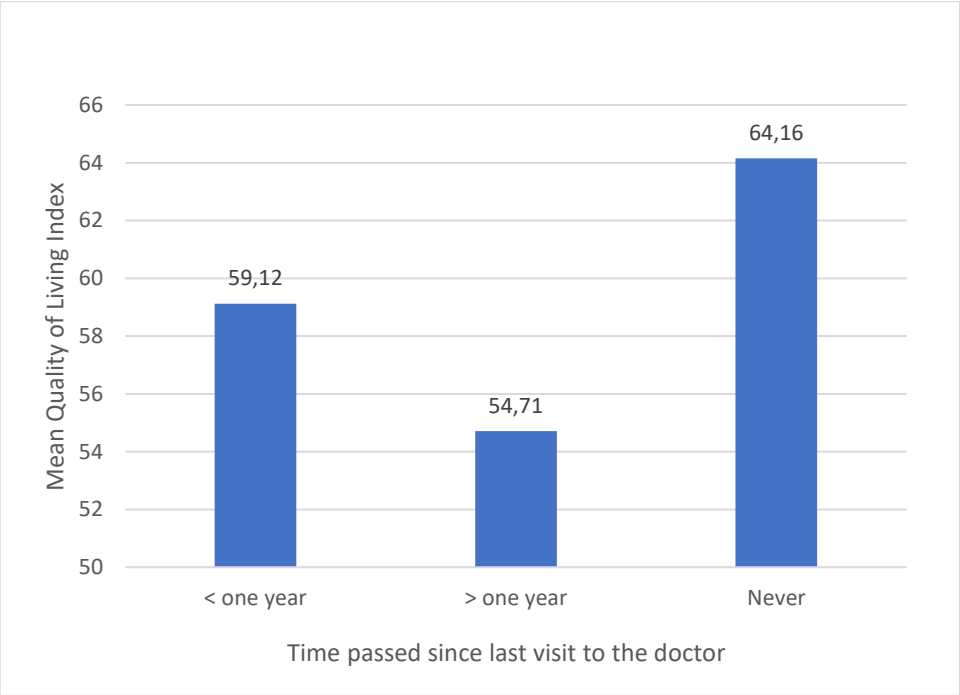

Figure 4.4. Mean QoLI according to time since last visit to the doctor

A similar trend was observed in the relationship between QoLI and time since the respondents' last blood test ($F_{2,434}=2.21$, $p=0.11$), but the difference was not significant.

A key factor in public health is the addressability of healthcare facility. The respondents' mean distance to the nearest medical unit/hospital was 2.6 km, with a median of 1 km (Q1 1, Q3 2, max 45) the distribution being non-normal. The distance to the nearest medical unit/hospital was weakly directly correlated with the time of the last visit to the doctor ($r_s=0.156$, $p<0.01$), and the time since last blood test ($r_s=0.087$, $p=0.035$).

The level of income also significantly correlated with the time since last visit to the doctor ($X^2(6) = 17.439$, $p=0.008$). There was no relationship with the time since last blood tests or when comparing the level of education with the frequency of doctor visits and blood tests performed.

5. Results from the 3rd study

The characteristics of the investigated cohort are summarized in Table 5.1. The mean age was 55 (±16) years, 31% were aged over 65 and 70% were female.

Table 5.1. Characteristics of the investigated cohort

Parameters	**All**		**Male**		**Female**	
	N	**Mean or %**	**N**	**Mean or %**	**N**	**Medie sau %**
Age	**2987**					
Years (mean ±SD)		54.9 (±16.3)	909	56.6 (±16)	2078	54.2 (±16.3)
>65 years (%)	920	30.8%	306	33.7%	614	29.5%
Gender	**2987**		909	30.4%	2078	69.6%
Smoking	**2407**					
Non-smoker	1778	73.9%	374	51.60%	1404	83.5%
Smoker	391	16.2%	186	25.7%	205	12.2%
Former smoker	238	9.9%	165	22.8%	73	4.3%
Weight status	**2380**					
Underweight	37	1.6%	9	1.3%	28	1.7%
Normal weight	778	32.7%	259	36.1%	519	31.2%
Overweight	819	34.4%	287	40%	532	32.0%
Obese	746	31.3%	162	22.6%	584	35.1%
Abdominal obesity	1397	59.2%	277	39.5%	1120	67.6%
BMI (mean± SD)	2380	27.9 (±5.9)	717	26.7 (±4.8)	1663	28.3 (±6.2)
Diabetes mellitus	**2388**					
Diabetes mellitus (all)	301	12.6%	118	16.3%	183	10.9%
Awareness	146	48.5%	58	58.6%	88	58.3%
Newly diagnosed	155	51.5%	60	49.2%	95	51.9%
Dyslipidemia	**2351**					
Dyslipidemia (all)	1523	64.7%	434	61.3%	1089	66.2%
Hypercholesterolemia	1008	42.9%	256	36.2%	752	45.7%
Hypertriglyceridemia	103	4.4%	43	6.1%	60	3.6%
Mixed dyslipidemia	409	17.4%	134	19%	275	16.7%
Hypertension	**2407**					
HTA (all)	1752	72.8%	559	77.1%	1193	70.9%
Newly diagnosed HT	584	33.3%	238	42.6%	346	29%
Previous history of HT	1168	66.7%	321	57.4%	847	71%
Treated	759	65%	179	55.8%	580	68.5%
Controlled HT	128	17.2%	35	19.7%	93	16.4%

SBP; (mean ±SD)	**2407**	145 (±25.5)	724	147.1 (±23.1)	1665	144.1 (±26.5)
DBP; (mean ±SD))	**2407**	87.8 (±13.9)	742	88.9 (±13.6)	1665	87.2 (±14.1)
Cardiovascular disease	**2407**					
CVD (all)	338	14.0%	104	14.3%	234	13.9%
CHD	216	9%	64	8.8%	152	9%
Stroke	71	2.9%	27	3.7%	44	2.6%
PAD	32	1.3%	9	1.2%	23	1.4%
AF	76	3.2%	27	3.7%	49	2.9%
Chronic kidney disease	1821	5.9%				
Chronic viral hepatitis	**2355**					
HBV	86	3.7%	34	4.8%	52	3,2%
HCV	111	4.7%	26	3,7%	85	5.2%

Cardiovascular risk factors

Smoking

The smoking frequency was relatively low, 16.2% were smokers and 9.9% were former smokers. The majority of smokers and former smokers were male (25.7% vs 12.2%, respectively, 22.8% vs. 4.3%; p=0.001) (Figure 5.1).

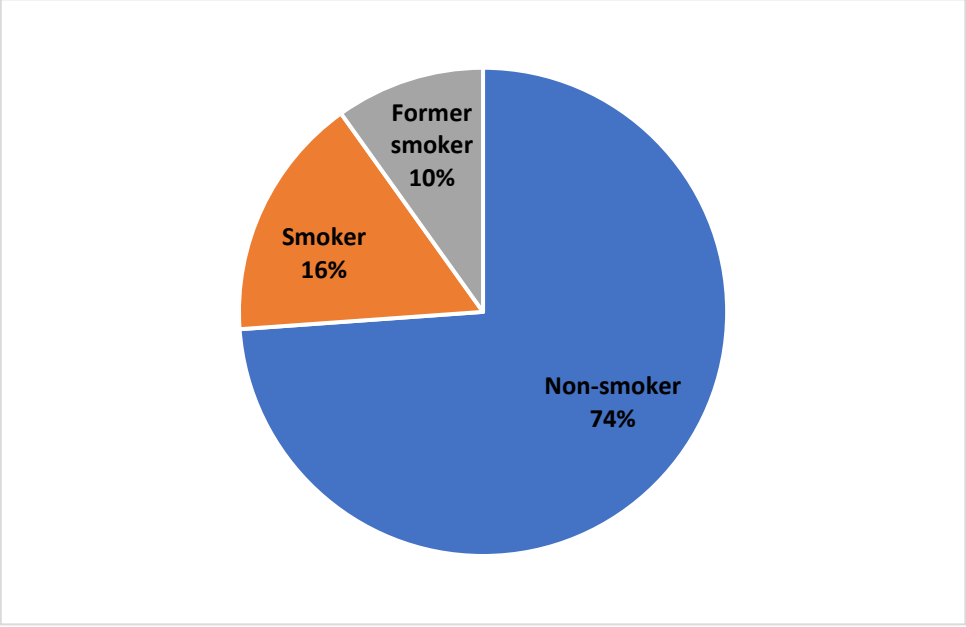

Figure 5.1. Prevalence of smokers, non-smokers and former smokers

Obesity

About 66% of the cohort had a BMI above 25kg/m2, and 31.3% were obese. Obesity and abdominal obesity were more frequent in females (35.1% vs 22.6%, p<0.001) and (67.6% vs 39.5%; p<0.001) (Figure 5.2).

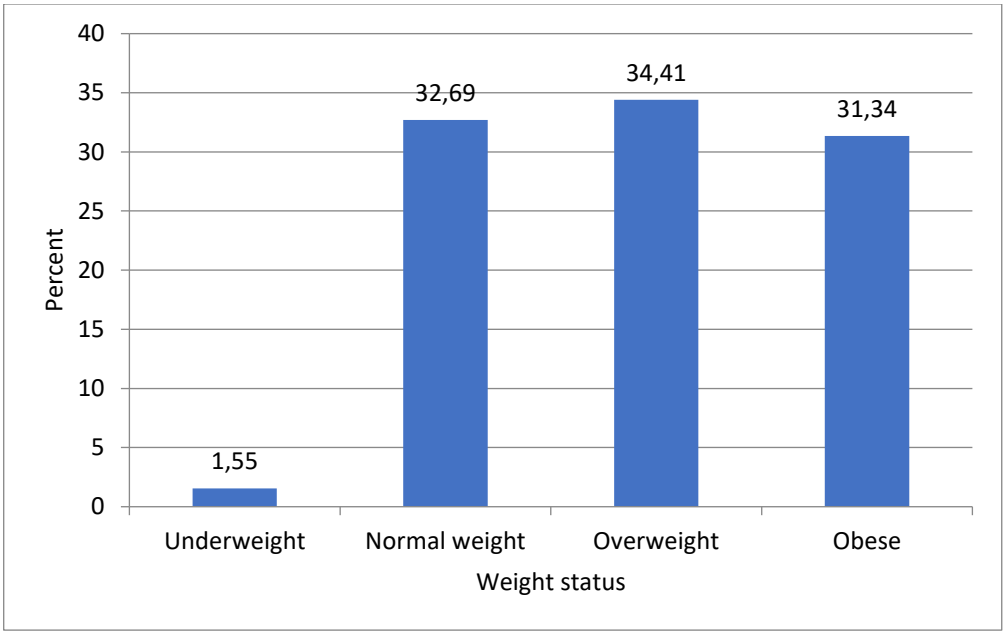

Figure 5.2. Weight status of the studied population

Diabetes mellitus

The prevalence of diabetes mellitus was 12.6%, and was higher in men (16.3% vs 11%, p<0.001). Half of the diabetics (51.5%) were newly diagnosed. (Figure 5.3).

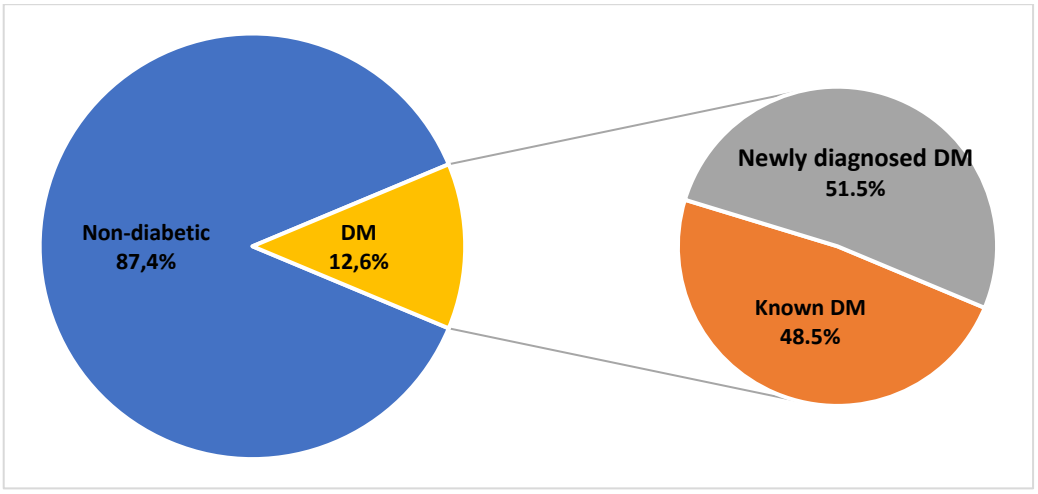

Figure 5.3. Prevalence of diabetes mellitus

Dyslipidemia

In this cohort, 64.7% had dyslipidemia (42.9% hypercholesterolemia, 4.4% hypertriglyceridemia and 17.4% mixed dyslipidemia). Dyslipidemia was more frequent in females (66.2% vs 61.3%, p=0.02) (Figure 5.4).

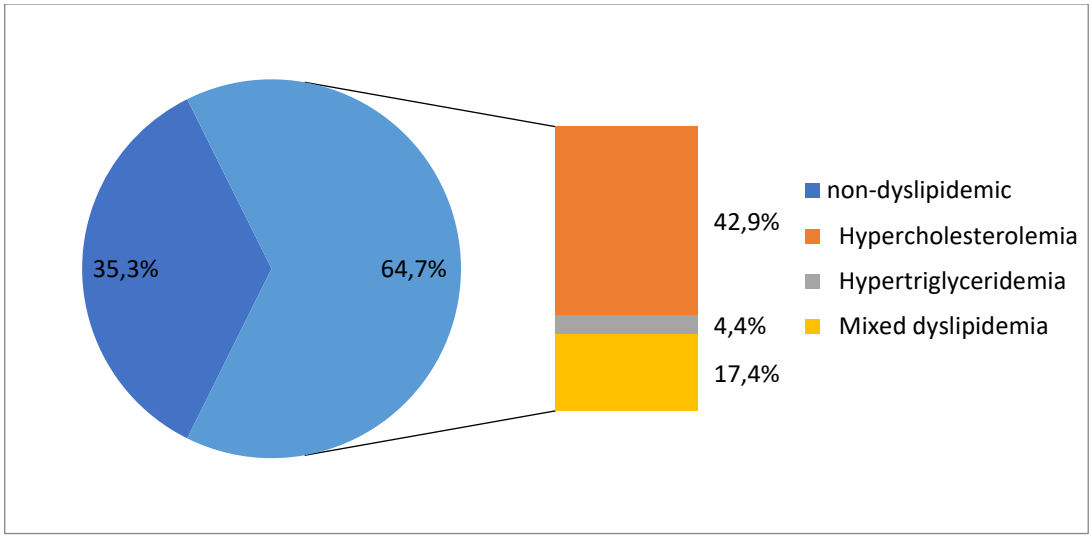

Figure 5.4. Prevalence and types of dyslipidemia

Hypertension

The mean SBP/ DBP was 145/87.8 mmHg and was higher in males than in females (147.1/88.9 vs 144.1/87.2 mmHg. HT prevalence (known and newly diagnosed) in the whole cohort was 72.8%. HT prevalence was related to age and gender: it was more frequent in males, and significantly increased with age in both sexes, reaching a plateau around 90% at ages above 60 years (Figure 5.5 and Figure 5.6).

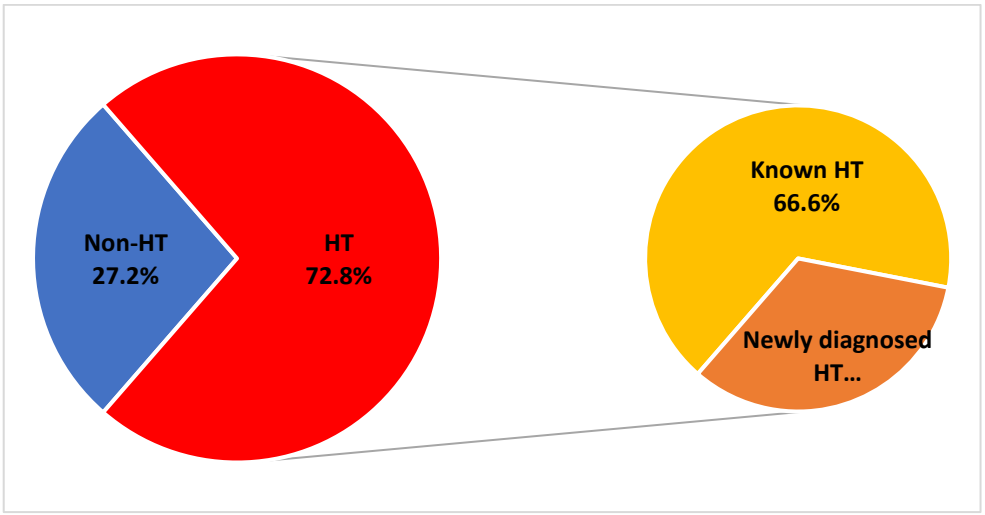

Figure 5.5. HT prevalence and distribution among known and newly diagnosed hypertensives

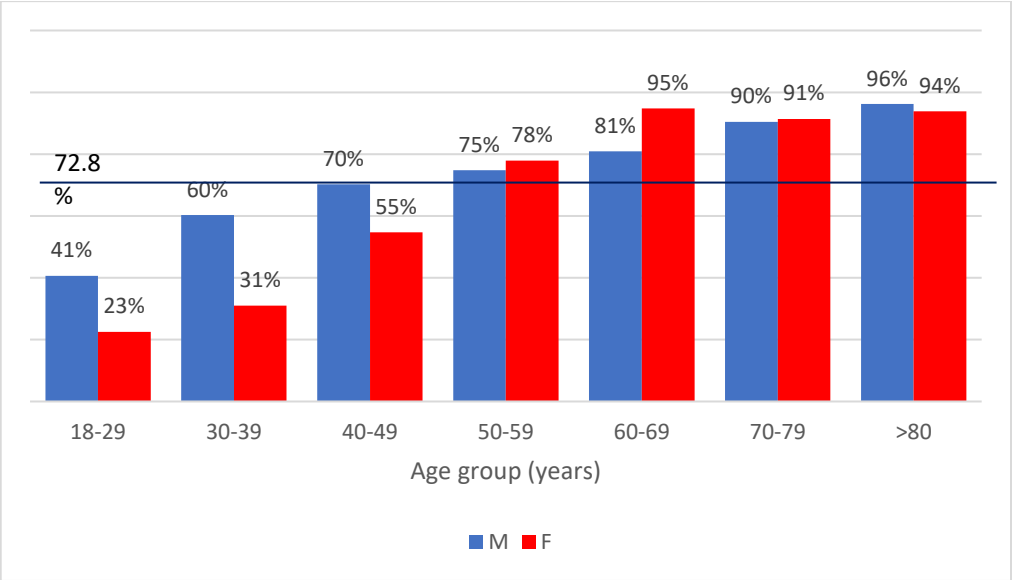

Figure 5.6. Prevalence of HT according to gender and age group

HT was newly diagnosed in 584 participants (33% of hypertensives). Accordingly, 66% of hypertensives were aware that they had HT. About two-thirds (65%) of those with known HT were treated, but only 17.2% were in target. More important, when counting all hypertensive subjects, i.e. known and newly diagnosed, HT was controlled in only in 8% (Figure 5.7).

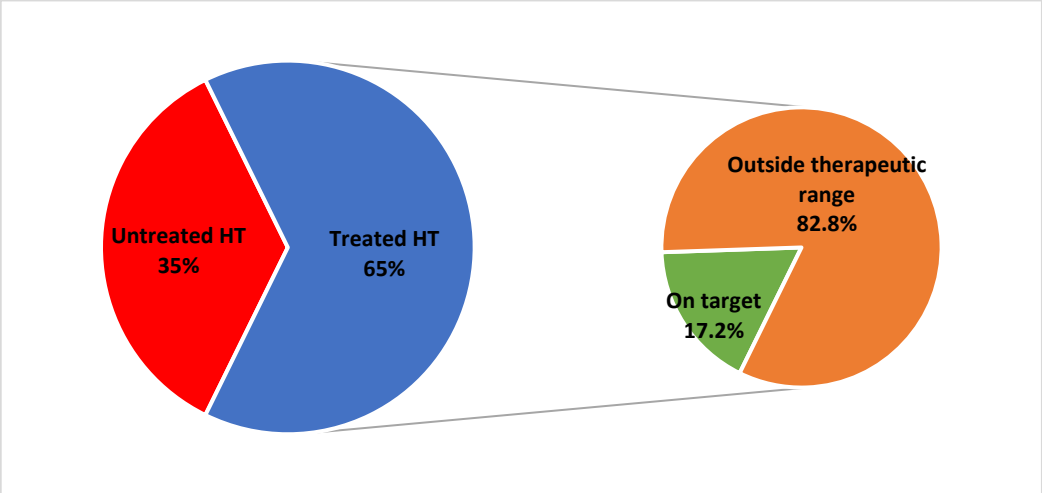

Figure 5.7 HT prevalence based on treatment and therapeutic range.

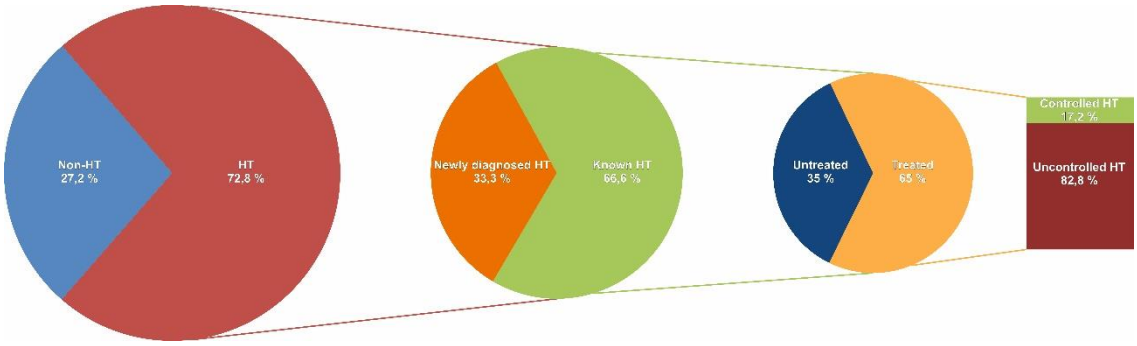

Figure 5.8. Total, known, treated and controlled HT

In a model of binary logistic regression, sex, age, obesity and diabetes mellitus, but not smoking were retained as factors independently associated with HT. Males were 1.3 times more likely to have HT than females, increasing age was associated with an increased likelihood of HT (1% per year), the odds of participants with obesity and diabetes to have HT were 2.9 and, respectively, 2.5 times higher (Table 5.2).

Table 5.2. Predictors of HT

	B	S.E.	Exp(B)	95% CI for EXP(B)		Sig.
Sex (male)	0.3	0.1	1.3	1.02	1.76	0.04
Age (years)	0.1	0	1.075	1.066	1.085	<0.001
Smoking (yes)	-0.2	0.1	0.8	0.6	1.1	0.17
Obesity (yes)	1	0.1	2.8	2.13	3.8	<0.001
Diabetes mellitus (yes)	0.9	0.3	2.5	1.49	4.19	<0.001
Constant	-3.4	0.2	0	-	-	<0.001
Binary logistic regression. Dependent variable HT Yes/No Independent variable entered in the first step: Sex, Age, Smoking, Obesity, Diabetes mellitus						
Chi^2 504.7; p<0.001; Cox&Snell R2=0.24 Hosmer&Lemeshow Chi^2 6.5; p=0.59						

HT was closely related to cardiovascular disease: 94% of patients with cardiovascular disease had HT

Cardiovascular disease

Prevalence

The prevalence of CVD was 14%: ischemic coronary heart disease (8.1%), stroke (2.7%), peripheral arterial disease (1.2%) and atrial fibrillation (2.7%). The distribution of CVDs was even between sexes but increased with age, reaching a prevalence over 20% in those older than 60 years (Table 5.3).

Table 5.3. Prevalence of CVD according to age group and sex

		Age group (years)						
		18-29	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**>80**
CVD	M	3.1%	0%	3.5%	11%	19.1%	22.1%	39.6%
	F	0.9%	1%	3.5%	10%	21%	30%	31.8%
	Total	1.4%	0.8%	3.5%	10.3%	20.4%	27.7%	35.3%

The CV risk factors were evaluated by logistic regression. Although increasing age was independently associated with an increased likelihood of CVD, obesity, smoking, and diabetes increased the likelihood of CVDs by 1.7 times; HT was the most important risk factor as it increased the risk by 2.7-fold (Table 5.4).

Table 5.4. Predictors of CVD

	B	S.E.	Exp(B)	95% CI for EXP(B)		Sig.
Sex (male)	0.06	0.15	1	0.7	1.4	0.68
Age (years)	0.06	0	1	1.05	1.07	<0.001
Obesity (yes)	0.55	0.15	1.7	1.2	2.3	<0.001
Smoking (yes)	0.58	0.28	1.7	1	3.1	0.04
Hypertension (yes)	1	0.28	2.7	1.5	4.7	<0.001
Diabetes mellitus (yes)	0.53	0.17	1.7	1.2	2.3	0.02
Constant	-7.3	0.52	0	-	-	<0.001
Binary logistic regression. Dependent variable CV disease (Yes/No). Independent variables entered in the first step: Sex, Age, Obesity, Smoking, Hypertension, Diabetes mellitus						
Chi^2 247.35; p<0.01; Cox&Snell R2=0.24 Hosmer&Lemeshow Chi^2 6.9; p=0.53						

Framingham cardiovascular risk

A high risk (>20%) of developing a CV in the next 10 years was noted in 33% of participants (N=1740) (Figure 5.9).

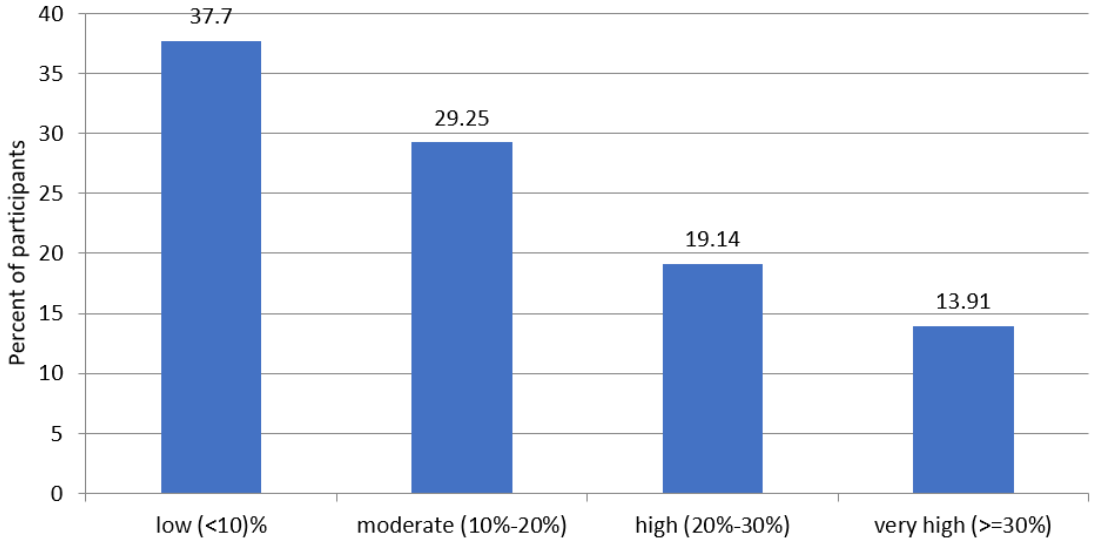

Figure 5.9. The 10-yeat risk of a CV event (Framingham)

SCORE

The mean global 10-year risk of fatal CV events of the entire cohort was 3.4%; 22% of participants had a risk over 5% (N=945) (Figure 5.10).

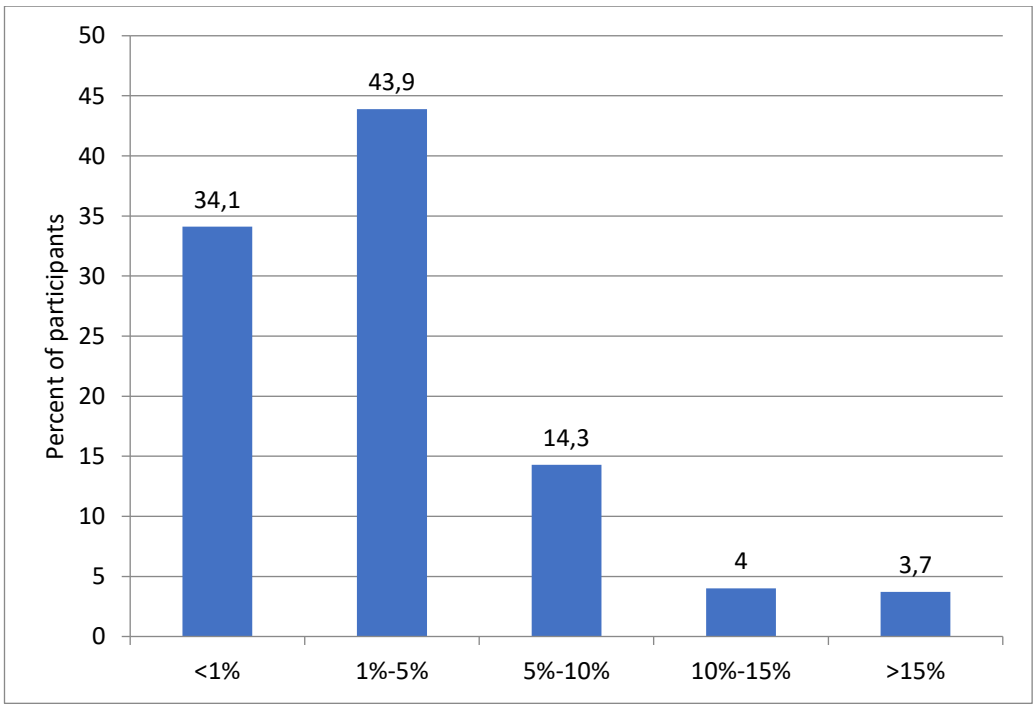

Figure 5.10. The 10-year risk of a fatal CV event (SCORE)

Chonic kidney disease

Prevalența bolii cronice de rinichi a fost de 5,9%, 107 dintre subiecți având, conform definiției KDIGO, alterată funcția renală fie prin scăderea ratei de filtrare glomerulară fie prin pierdere de proteine (Table 5.5).

Table 5.5. Prevalence of CKD and risk categories

			Albuminuria categories		
			A1	**A2**	**A3**
			<30	30 - 300	>300
			Normal to mildly increased	Moderately increased	Severly increased
GFR categories	**G1** – normal or high	≥90	1078	18	1
	G2 – mildly decreased	60-89	636	11	2
	G3a – mildly – moderately decrease	45-59	50	7	0
	G3b – moderately-severly decreased	30-44	14	2	0
	G4 – deverly decreased	15-29	1	0	0
	G5 – kidney failure	<15	0	1	0

Low risk	1.714	94,1%
Moderate risk	79	4,3%
High risk	24	1,3%
Very high risk	4	0,2%
CKD	**107**	**5,9%**

Chronic viral hepatitis

The prevalence of chronic hepatitis B and C was 3,7%, respectively 4,7% (Figure 5.11, Figure 5.12).

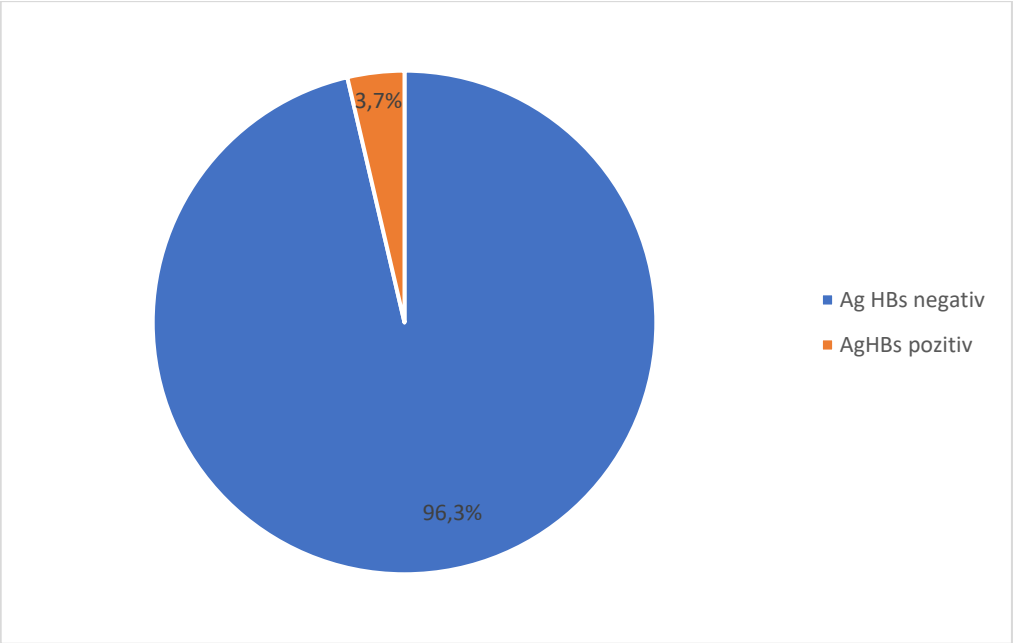

Figure 5.11.Prevalance of chronic hepatitis B

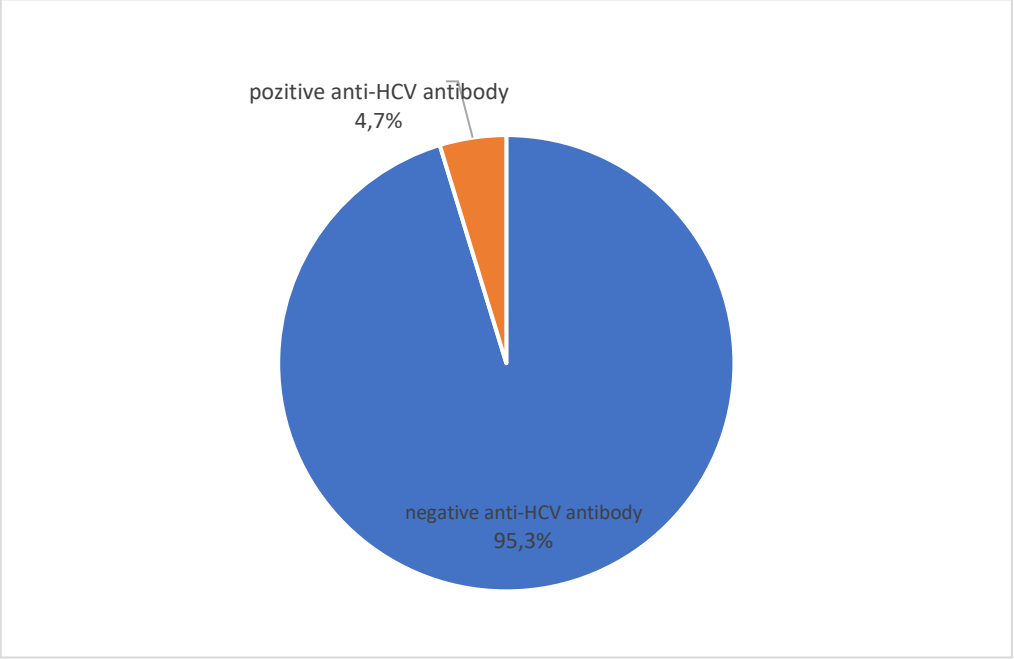

Figure 5.12. Prevalence of chronic hepatitis C

6. Conclusions and personal contributions

Conclusions

In Romania there are major inequities in terms of access to health services for the rural population, which represents 46% of the country's population.

The population of Romania has experienced in the last 20 years a constant demographic decline and an increase in demographic aging, which is highlighted by the increase of the population over 65 years, along with the increase of the average age of the general population. One of the causes of the accentuation of the demographic aging phenomenon is the birth rate cap, which has remained constant for the last 20 years.

These phenomena are more pronounced when we compare the inhabitants of the rural area with those of the urban area: the rural population is an older population, with a higher share of people aged > 65 years (20.3% vs 16.9%) and with a higher mortality rate than their urban counterparts. Also, the inhabitants of the rural area have poor access to health services, most of the health providers and medical institutions being concentrated in urban areas. Of the 63 thousand sanitary units in Romania, the majority (81.5%) are found in urban areas, where almost two thirds of the sanitary staff work. In rural areas, more than 8 times more inhabitants are allocated to a doctor (1.3 times more inhabitants to a family doctor), 6 times more inhabitants to a dentist and almost 4 times more inhabitants to pharmacist compared to the urban population.

There is a direct relationship between the quality of living and the level of health. The Quality of Living Index, a tool composed *de novo* through the statistical method of principal component analysis and based on questionnaires applied in the field, was higher for those who go to the doctor more often and do regular medical check-ups and tests. Thus, as the quality of living improves, so does the time allocated to health. Unsurprisingly, there is a direct correlation between the quality of living and the level of education and income of an individual, and QoLI highlights the potential role of this composite index in identifying areas with major infrastructure problems and access to public services, which can be used in studies for territorial planning or development strategies at regional, Table or local level.

The information regarding the health status of the rural Romanian population that was collected during the medical caravans revealed worrying data. The results showed an extremely high prevalence of hypertension in the rural adult population (72.8%) and showed

a high percentage of undiagnosed patients (33.3%), as well as a low number of treated hypertensives who are in therapeutic target.

Other CV risk factors were similar to the reported prevalence at national level: obesity (31.3%), dyslipidemia (64.7%), diabetes (12.6%). Obesity, smoking and diabetes increased the probability that participants had CVD by 1.7 times, HT being the main factor that increases the risk of CVD by 2.7 times. Framingham and SCORE cardiovascular risk scores showed that one third of the rural population (33%) has a high risk (> 20%) of developing a CV event, while almost a quarter of the population (22%) has a high risk 5% of suffering a fatal CV event in the next 10 years.

The prevalence of chronic kidney disease was 5.9%, and hepatitis B and C was 3.7% and 4.7%, respectively.

While this analysis of the health status of Romania's rural population needs to be further extended to include areas in all regions of the country, the large number of participants makes this study extremely relevant. The results showed that there is a segment of the population - the rural population - that has an underestimated prevalence of hypertension and has a high risk of developing CVD; a population with a low usage of medical services, with poor education and inadequate infrastructure, which needs better access to health services.

Personal contributions

In this paper we showed that a major problem of the Romanian medical system is the poor access of the rural population to health services. The needs of the population in rural areas are more serious and greater compared to the urban area where specialized medical services are currently concentrated. In the first study we analyzed the demographics of the rural population, which is an older population with a higher mortality rate than their urban counterparts. Also, from the analysis of the infrastructure and distribution of health units and health personnel we showed that rural residents have poor access to health services, the medical system being concentrated in urban areas.

Through the second study we created a composite quality of living index using questionnaires applied to 703 respondents through which we collected data on housing, education, income and accessibility to health services. Thus, we showed that there is a direct relationship between the quality of living and the level of education, income and frequency of accessing health services.

Furthermore, analyzing the data of 2988 patients examined during the medical caravans, we showed that there is a segment of the population - the rural population - that has an underestimated prevalence of hypertension and has a high risk of developing CVD; a population with a low usage of medical services, with poor education and inadequate infrastructure, which needs better access to health services.

Medical caravans

The concept of medical caravans is a relatively new concept that appeared in the last 10 years, which I developed together with other colleagues through the "Doctors' Caravan" Association where I am co-founder. The "Doctors' Caravan" Association is a non-governmental organization composed of doctors and medical students who travel voluntarily to rural areas of Romania and provide free medical services. This new way of providing medical services, through which the medical staff travels where they are most needed, appeared as a reaction to the shortage of medical services in rural areas. The project was a real success, realizing, in just a few years over 100 medical caravans from which tens of thousands of patients have benefited so far. The utility and efficiency of the caravans led me to write in 2021, together with my colleagues, a legislative proposal that was adopted in 2020 - Law 65 - which brings a supplement to art.135 of Law 95 / 2006 recognizing that medical services can be provided through medical caravans organized in buildings that have a sanitary authorization. Next, in 2021, we submitted a much larger project entitled the Mobile Health Care Act, a legislative proposal that was ratified and adopted in Parliament in March 2022. The law aims to define the framework through which mobile medical services can be provided in areas with poor coverage of health services, for prevention and prophylaxis, screening of most frequent medical conditions, as well as periodic medical examinations. We hope that through this law, the model proposed by us will be adopted at a national level by as many health providers as possible, thus improving access to medical services in areas with poor coverage of health services.

A new model for providing medical aid – Mobile Health Care Act

This legal framework contributes to shaping a new paradigm of providing medical services: mobile healthcare, where the medical system comes to the patient and not the other way around. It is complementary and synergistic with the law of mobile medical offices and units already stipulated in the law.

Early detection of chronic diseases through screening methods, detection of new pathologies through specialized medical consultation, reconsideration of the therapeutic plan for chronic patients following re-evaluation that has as final goal either prevention of decompensation or directing them to specialized medical units in in order to avoid exacerbations, as well as access to health education, can be provided through medical caravans.

Thus, physicians can practice their profession outside the medical unit where they are employed, their activity being recognized as part of the working norm and remunerated for the medical service provided in the caravans. At the same time, this new concept of healthcare improves patients' access to health services in areas without medical infrastructure. Moreover, depending on the complexity of the caravan and the needs of the community, a mobile specialized outpatient clinic can be set up that can cover a wider range of specialized medical services.

The mobile health care offers services for prevention and prophylaxis, screening of the most prevalent medical conditions, but also a regular general or specialized medical control, these services being complementary to family medicine. The medical caravans can be organized by the Table hospitals or by other hospitals, polyclinics, outpatient clinics, individual medical offices under contract with the health insurance company, and the services offered within them will be covered by the National Health Insurance House the same way they are covered in a normal clinic.

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